

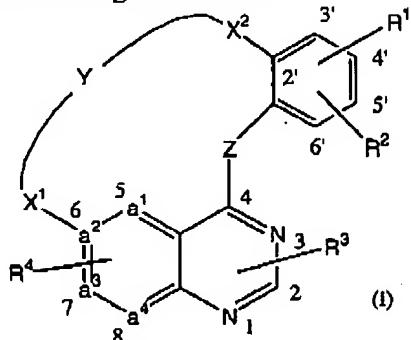
RECEIVED USSN 10/596,512
CENTRAL FAX CENTER Docket No. PRD2170USPCT

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Listing of Claims:

This listing of claims replaces all prior versions, and listings, of claims in the captioned application.

1. (Original) A compound having the formula



the *N*-oxide forms, the pharmaceutically acceptable addition salts and the stereochemically isomeric forms thereof, wherein

$a^1 - a^2 = a^3 - a^4$ represents a divalent radical selected from N-CH=CH-CH, N-CH=N-CH or CH-CH=N-CH;

Z represents O, NH or S;

Y represents -C₃₋₉alkyl-, -C₃₋₉alkenyl-, -C₁₋₅alkyl-oxy-C₁₋₅alkyl-,

-C₁₋₅alkyl-NR¹³-C₁₋₅alkyl-, -C₁₋₅alkyl-NR¹⁴-CO-C₁₋₅alkyl-,

-C₁₋₅alkyl-CO-NR¹⁵-C₁₋₅alkyl-, -C₁₋₆alkyl-CO-NH-,

-C₁₋₆alkyl-NH-CO-, -CO-NH-C₁₋₆alkyl-, -NH-CO-C₁₋₆alkyl-, -CO-C₁₋₇alkyl-,

-C₁₋₇alkyl-CO-, C₁₋₆alkyl-CO-C₁₋₆alkyl;

X' represents a direct bond, O, -O-C₁₋₂alkyl-, CO, -CO-C₁₋₂alkyl-, NR¹¹,

-NR¹¹-C₁₋₂alkyl-, NR¹⁶-CO-, NR¹⁶-CO-C₁₋₂alkyl-, -O-N=CH- or C₁₋₂alkyl;

X^2 represents a direct bond, O, -O-C₁₋₂alkyl-, CO, -CO- C₁₋₂alkyl-, NR¹²,

NR¹²-C₁₋₂alkyl-, NR¹⁷-CO-, NR¹⁷-CO-C₁₋₂alkyl-, Het²⁰-C₁₋₂alkyl-, -O-N=CH- or C₁₋₂alkyl;

R^1 represents hydrogen, cyano, halo, hydroxy, formyl, C_{1-6} alkoxy-, C_{1-6} alkyl-,

C₁₋₆alkoxy- substituted with halo,

C₁-4alkyl substituted with one or where possible two or more substituents selected from hydroxy or halo;

R^2 represents hydrogen, cyano, halo, hydroxy, hydroxycarbonyl-, Het¹⁶-carbonyl-, C₁₋₄alkyloxycarbonyl-, C₁₋₄alkylcarbonyl-, aminocarbonyl-, mono- or

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di(C₁₋₄alkyl)aminocarbonyl-, Het¹, formyl, C₁₋₄alkyl-, C₂₋₆alkynyl-, C₃₋₆cycloalkyl-,
C₃₋₆cycloalkyloxy-, C₁₋₆alkoxy-, Ar⁵, Ar¹-oxy-, dihydroxyborane,
C₁₋₆alkoxy- substituted with halo,
C₁₋₄alkyl substituted with one or where possible two or more substituents selected
from halo, hydroxy or NR⁵R⁶,
C₁₋₄alkylcarbonyl- wherein said C₁₋₄alkyl is optionally substituted with one or
where possible two or more substituents selected from hydroxy or
C₁₋₄alkyl-oxy-;

R³ represents hydrogen, C₁₋₄alkyl, cyano or C₁₋₄alkyl substituted with one or more
substituents selected from halo, C₁₋₄alkyloxy-, amino-, mono- or
di(C₁₋₄alkyl)amino-, C₁₋₄alkyl-sulfonyl- or phenyl;

R⁴ represents hydrogen, hydroxy, Ar³-oxy, Ar⁴-C₁₋₄alkyloxy-, C₁₋₄alkyloxy-,
C₂₋₄alkenyloxy- optionally substituted with Het¹² or R⁴ represents C₁₋₄alkyloxy
substituted with one or where possible two or more substituents selected from
C₁₋₄alkyloxy-, hydroxy, halo, Het²-, -NR⁷R⁸, -carbonyl- NR⁹R¹⁰ or Het³-
carbonyl-;

R⁵ and R⁶ are each independently selected from hydrogen or C₁₋₄alkyl;

R⁷ and R⁸ are each independently selected from hydrogen, C₁₋₄alkyl, Het⁸,
aminosulfonyl-, mono- or di (C₁₋₄alkyl)-aminosulfonyl, hydroxy-C₁₋₄alkyl-,
C₁₋₄alkyl-oxy-C₁₋₄alkyl-, hydroxycarbonyl-C₁₋₄alkyl-, C₃₋₆cycloalkyl, Het⁹-
carbonyl-C₁₋₄alkyl-, Het¹⁰-carbonyl-, polyhydroxy-C₁₋₄alkyl-, Het¹¹-C₁₋₄alkyl- or
Ar²-C₁₋₄alkyl-;

R⁹ and R¹⁰ are each independently selected from hydrogen, C₁₋₄alkyl, C₃₋₆cycloalkyl,
Het⁴, hydroxy-C₁₋₄alkyl-, C₁₋₄alkyloxyC₁₋₄alkyl- or polyhydroxy-C₁₋₄alkyl-;

R¹¹ represents hydrogen, C₁₋₄alkyl, Het⁵, Het⁶-C₁₋₄alkyl-, C₂₋₄alkenylcarbonyl-
optionally substituted with Het⁷-C₁₋₄alkylaminocarbonyl-, C₂₋₄alkenylsulfonyl-,
C₁₋₄alkyloxyC₁₋₄alkyl- or phenyl optionally substituted with one or where possible
two or more substituents selected from hydrogen, hydroxy, amino or C₁₋₄alkyloxy-;

R¹² represents hydrogen, C₁₋₄alkyl, C₁₋₄alkyl-oxy-carbonyl-, Het¹⁷, Het¹⁸-C₁₋₄alkyl-,
C₂₋₄alkenylcarbonyl- optionally substituted with Het¹⁹-C₁₋₄alkylaminocarbonyl-,
C₂₋₄alkenylsulfonyl-, C₁₋₄alkyloxyC₁₋₄alkyl- or phenyl optionally substituted with
one or where possible two or more substituents selected from hydrogen, hydroxy,
amino or C₁₋₄alkyloxy-;

R¹³ represents hydrogen, C₁₋₄alkyl, Het¹³, Het¹⁴-C₁₋₄alkyl- or phenyl optionally
substituted with one or where possible two or more substituents selected from
hydrogen, hydroxy, amino or C₁₋₄alkyloxy-;

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R^{14} and R^{15} are each independently selected from hydrogen, C_{1-4} alkyl, $Het^{15}-C_{1-4}$ alkyl- or C_{1-4} alkyloxy C_{1-4} alkyl-;

R^{16} and R^{17} are each independently selected from hydrogen, C_{1-4} alkyl, $Het^{21}-C_{1-4}$ alkyl- or C_{1-4} alkyloxy C_{1-4} alkyl-;

Het^1 represents a heterocycle selected from piperidinyl, morpholinyl, piperazinyl, furanyl, pyrazolyl, dioxolanyl, thiazolyl, oxazolyl, imidazolyl, isoxazolyl, oxadiazolyl, pyridinyl or pyrrolidinyl wherein said Het^1 is optionally substituted with one or where possible two or more substituents selected from amino, C_{1-4} alkyl, hydroxy- C_{1-4} alkyl-, phenyl, phenyl- C_{1-4} alkyl-, C_{1-4} alkyl-oxy- C_{1-4} alkyl- mono- or di(C_{1-4} alkyl)amino- or amino-carbonyl-;

Het^2 represents a heterocycle selected from morpholinyl, piperazinyl, piperidinyl, pyrrolidinyl, thiomorpholinyl or dithianyl wherein said Het^2 is optionally substituted with one or where possible two or more substituents selected from hydroxy, halo, amino, C_{1-4} alkyl-, hydroxy- C_{1-4} alkyl-, C_{1-4} alkyl-oxy- C_{1-4} alkyl-, hydroxy- C_{1-4} alkyl-oxy- C_{1-4} alkyl-, mono- or di(C_{1-4} alkyl)amino-, mono- or di(C_{1-4} alkyl)amino- C_{1-4} alkyl-, amino- C_{1-4} alkyl-, mono- or di(C_{1-4} alkyl)amino-sulfonyl-, aminosulfonyl-, aminosulfonyl-;

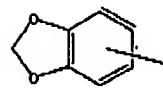
Het^3 , Het^4 and Het^8 each independently represent a heterocycle selected from morpholinyl, piperazinyl, piperidinyl, furanyl, pyrazolyl, dioxolanyl, thiazolyl, oxazolyl, imidazolyl, isoxazolyl, oxadiazolyl, pyridinyl or pyrrolidinyl wherein said Het^3 , Het^4 or Het^8 is optionally substituted with one or where possible two or more substituents selected from hydroxy-, amino-, C_{1-4} alkyl-, C_{3-6} cycloalkyl- C_{1-4} alkyl-, aminosulfonyl-, mono- or di(C_{1-4} alkyl)aminosulfonyl or amino- C_{1-4} alkyl-;

Het^5 represent a heterocycle selected from pyrrolidinyl or piperidinyl wherein said heterocycle is optionally substituted with one or where possible two or more substituents selected from C_{1-4} alkyl, C_{3-6} cycloalkyl, hydroxy- C_{1-4} alkyl-, C_{1-4} alkyloxy C_{1-4} alkyl or polyhydroxy- C_{1-4} alkyl-;

Het^6 and Het^7 each independently represent a heterocycle selected from morpholinyl, pyrrolidinyl, piperazinyl or piperidinyl wherein said Het^6 and Het^7 are optionally substituted with one or where possible two or more substituents selected from C_{1-4} alkyl, C_{3-6} cycloalkyl, hydroxy- C_{1-4} alkyl-, C_{1-4} alkyloxy C_{1-4} alkyl or polyhydroxy- C_{1-4} alkyl-;

Het^9 and Het^{10} each independently represent a heterocycle selected from furanyl, piperidinyl, morpholinyl, piperazinyl, pyrazolyl, dioxolanyl, thiazolyl, oxazolyl, imidazolyl, isoxazolyl, oxadiazolyl, pyridinyl or pyrrolidinyl wherein said Het^9 or Het^{10} is optionally substituted C_{1-4} alkyl, C_{3-6} cycloalkyl- C_{1-4} alkyl- or amino- C_{1-4} alkyl-;

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Het¹¹ represents a heterocycle selected from indolyl or

Het¹² represents a heterocycle selected from morpholinyl, piperazinyl, piperidinyl, pyrrolidinyl, thiomorpholinyl or dithianyl wherein said Het¹² is optionally substituted with one or where possible two or more substituents selected from hydroxy, halo, amino, C₁₋₄alkyl-, hydroxy-C₁₋₄alkyl-, C₁₋₄alkyl-oxy-C₁₋₄alkyl-, hydroxy-C₁₋₄alkyl-oxy-C₁₋₄alkyl-, mono- or di(C₁₋₄alkyl)amino- or mono- or di(C₁₋₄alkyl)amino-C₁₋₄alkyl-;

Het¹³ represent a heterocycle selected from pyrrolidinyl or piperidinyl wherein said heterocycle is optionally substituted with one or where possible two or more substituents selected from C₁₋₄alkyl, C₃₋₆cycloalkyl, hydroxy-C₁₋₄alkyl-, C₁₋₄alkyloxyC₁₋₄alkyl or polyhydroxy-C₁₋₄alkyl-;

Het¹⁴ represent a heterocycle selected from morpholinyl, pyrrolidinyl, piperazinyl or piperidinyl wherein said heterocycle is optionally substituted with one or where possible two or more substituents selected from C₁₋₄alkyl, C₃₋₆cycloalkyl, hydroxy-C₁₋₄alkyl-, C₁₋₄alkyloxyC₁₋₄alkyl or polyhydroxy-C₁₋₄alkyl-;

Het¹⁵ and Het²¹ each independently represent a heterocycle selected from morpholinyl, pyrrolidinyl, piperazinyl or piperidinyl wherein said Het¹⁵ or Het²¹ are optionally substituted with one or where possible two or more substituents selected from C₁₋₄alkyl, C₃₋₆cycloalkyl, hydroxy-C₁₋₄alkyl-, C₁₋₄alkyloxyC₁₋₄alkyl or polyhydroxy-C₁₋₄alkyl-;

Het¹⁶ represent a heterocycle selected from morpholinyl, pyrrolidinyl, piperazinyl, 1,3,2-dioxaborolane or piperidinyl wherein said heterocycle is optionally substituted with one or more substituents selected from C₁₋₄alkyl;

Het¹⁷ represent a heterocycle selected from pyrrolidinyl or piperidinyl wherein said heterocycle is optionally substituted with one or where possible two or more substituents selected from C₁₋₄alkyl, C₃₋₆cycloalkyl, hydroxy-C₁₋₄alkyl-, C₁₋₄alkyloxyC₁₋₄alkyl or polyhydroxy-C₁₋₄alkyl-;

Het¹⁸ and Het¹⁹ each independently represent a heterocycle selected from morpholinyl, pyrrolidinyl, piperazinyl or piperidinyl wherein said Het¹⁸ and Het¹⁹ are optionally substituted with one or where possible two or more substituents selected from C₁₋₄alkyl, C₃₋₆cycloalkyl, hydroxy-C₁₋₄alkyl-, C₁₋₄alkyloxyC₁₋₄alkyl or polyhydroxy-C₁₋₄alkyl-;

Het²⁰ represents a heterocycle selected from pyrrolidinyl, 2-pyrrolidinyl, piperidinyl, piperazinyl or pyrazolidinyl wherein said heterocycle is optionally substituted with one or where possible two or more substituents selected from C₁₋₄alkyl,

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C_{3-6} cycloalkyl, hydroxy- C_{1-4} alkyl-, C_{1-4} alkyloxy C_{1-4} alkyl or polyhydroxy- C_{1-4} alkyl-; and

Ar^1 , Ar^2 , Ar^3 , Ar^4 and Ar^5 each independently represent phenyl optionally substituted with cyano, C_{1-4} alkylsulfonyl-, C_{1-4} alkylsulfonylamino-, aminosulfonylamino-, hydroxy- C_{1-4} alkyl, aminosulfonyl-, hydroxy-, C_{1-4} alkyloxy- or C_{1-4} alkyl.

2. (Original) A compound according to claim 1 wherein;

Z represents NH;

Y represents $-C_{3-9}$ alkyl-, $-C_{2-9}$ alkenyl-, $-C_{1-5}$ alkyl-oxy- C_{1-5} alkyl-, $-C_{1-5}$ alkyl-NR¹³- C_{1-5} alkyl-, $-C_{1-5}$ alkyl-NR¹⁴-CO- C_{1-5} alkyl-, $-C_{1-6}$ alkyl-NH-CO-, -CO-C $1-5$ alkyl-, $-C_{1-7}$ alkyl-CO- or C_{1-6} alkyl-CO- C_{1-6} alkyl;

X^1 represents O, -O- C_{1-2} alkyl-, -O-N=CH-, NR¹¹ or -NR¹¹- C_{1-2} alkyl-; in a particular embodiment X^1 represents a direct bond, C_{1-2} alkyl-, -O- C_{1-2} alkyl-, NR¹¹-, -O- or -O-CH₂-;

X^2 represents a direct bond, O, -O- C_{1-2} alkyl-, -O-N=CH-, NR¹⁷-CO-, NR¹⁷-CO- C_{1-2} alkyl-, C_{1-2} alkyl, Het²⁰- C_{1-2} alkyl-, NR¹² or NR¹²- C_{1-2} alkyl-; in a particular embodiment X^2 represents a direct bond, C_{1-2} alkyl-, -O- C_{1-2} alkyl, NR¹⁷-CO-, NR¹⁷-CO- C_{1-2} alkyl-, Het²⁰- C_{1-2} alkyl-, -O- or -O-CH₂-;

R^1 represents hydrogen, cyano, halo or hydroxy, preferably halo;

R^2 represents hydrogen, cyano, halo, hydroxy, hydroxycarbonyl-, C_{1-4} alkyloxycarbonyl-, Het¹⁶-carbonyl-, C_{1-4} alkyl-, C_{2-6} alkynyl-, Ar⁵ or Het¹; in a further embodiment R^2 represents hydrogen, cyano, halo, hydroxy, or Ar⁵; in a more particular embodiment R^2 represents hydrogen or halo;

R^3 represents hydrogen;

R^4 represents hydrogen, hydroxy, C_{1-4} alkyloxy-, Ar⁴- C_{1-4} alkyloxy or R^4 represents C_{1-4} alkyloxy substituted with one or where possible two or more substituents selected from

C_{1-4} alkyloxy- or Het²;

R^{11} represents hydrogen, C_{1-4} alkyl- or C_{1-4} alkyl-oxy-carbonyl-;

R^{12} represents hydrogen, C_{1-4} alkyl- or C_{1-4} alkyl-oxy-carbonyl-;

R^{13} represents hydrogen or Het¹⁴- C_{1-4} alkyl, in particular morpholinyl- C_{1-4} alkyl;

R^{14} represents hydrogen or C_{1-4} alkyl;

R^{17} represents hydrogen, C_{1-4} alkyl-, Het²¹- C_{1-4} alkyl or C_{1-4} alkyl-oxy- C_{1-4} alkyl; in particular R^{17} represents hydrogen or C_{1-4} alkyl;

Het¹ represents thiazolyl optionally substituted with amino, C_{1-4} alkyl, hydroxy- C_{1-4} alkyl-, phenyl, phenyl- C_{1-4} alkyl-, C_{1-4} alkyl-oxy- C_{1-4} alkyl-, mono- or di(C_{1-4} alkyl)amino- or amino-carbonyl-;

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Het² represents a heterocycle selected from morpholinyl, piperazinyl, piperidinyl or pyrrolidinyl wherein said Het² is optionally substituted with one or where possible two or more substituents selected from hydroxy, amino or C₁₋₄alkyl-; In a further embodiment Het² represents a heterocycle selected from morpholinyl or piperidinyl optionally substituted with C₁₋₄alkyl-, preferably methyl;

Het¹⁴ represents a heterocycle selected from morpholinyl, piperazinyl, piperidinyl or pyrrolidinyl wherein said Het¹⁴ is optionally substituted with one or where possible two or more substituents selected from hydroxy, amino or C₁₋₄alkyl-;

Het¹⁶ represents a heterocycle selected from piperidinyl, morpholinyl or pyrrolidinyl;

Het²⁰ represents a heterocycle selected from pyrrolidinyl, 2-pyrrolidinyl or piperidinyl;

Het²¹ represents a heterocycle selected from morpholinyl, piperazinyl, piperidinyl or pyrrolidinyl wherein said Het²¹ is optionally substituted with one or where possible two or more substituents selected from hydroxy, amino or C₁₋₄alkyl-;

Ar⁴ represents phenyl optionally substituted with cyano, hydroxy-, C₁₋₄alkyloxy or C₁₋₄alkyl;

Ar⁵ represents phenyl optionally substituted with cyano, hydroxy, C₁₋₄alkyloxy or C₁₋₄alkyl.

3. (Original) A compound according to claim 1 wherein;

Z represents NH;

Y represents -C₁₋₉alkyl-, -C₁₋₅alkyl-NR¹³-C₁₋₅alkyl-, -C₁₋₅alkyl-NR¹⁴-CO-C₁₋₅alkyl-, -C₁₋₆alkyl-NH-CO- or -CO-NH-C₁₋₆alkyl-;

X¹ represents -O-, -NR¹¹-, -NR¹⁶-CO-, or -NR¹⁶-CO-C₁₋₂alkyl-;

X² represents a direct bond, -C₁₋₂alkyl-, -O-C₁₋₂alkyl, -O-, -O-CH₂- or Het²⁰-C₁₋₂alkyl-;

R¹ represents hydrogen or halo;

R² represents hydrogen, cyano, halo, hydroxycarbonyl-, C₁₋₄alkyloxycarbonyl-, Het¹⁶-carbonyl- or Ar⁵; in particular R² represents hydrogen or halo;

R³ represents hydrogen;

R⁴ represents hydrogen, hydroxy, C₁₋₄alkyloxy-, Ar⁴-C₁₋₄alkyloxy or R⁴ represents C₁₋₄alkyloxy substituted with one or where possible two or more substituents selected from

C₁₋₄alkyloxy- or Het²-;

R¹¹ represents hydrogen;

R¹² represents hydrogen, C₁₋₄alkyl- or C₁₋₄alkyl-oxy-carbonyl-;

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R^{13} represents hydrogen or Het^{14} - C_{1-4} alkyl, in particular hydrogen or morpholinyl- C_{1-4} alkyl;

Het^2 represents a heterocycle selected from morpholinyl, piperazinyl, piperidinyl or pyrrolidinyl wherein said Het^2 is optionally substituted with one or where possible two or more substituents selected from hydroxy, amino or C_{1-4} alkyl-; In a further embodiment Het^2 represents a heterocycle selected from morpholinyl or piperidinyl optionally substituted with C_{1-4} alkyl-, preferably methyl;

Het^{14} represents morpholinyl;

Het^{16} represents a heterocycle selected from morpholinyl or pyrrolidinyl;

Het^{20} represents pyrrolidinyl or piperidinyl;

Ar^4 represents phenyl;

Ar^5 represents phenyl optionally substituted with cyano.

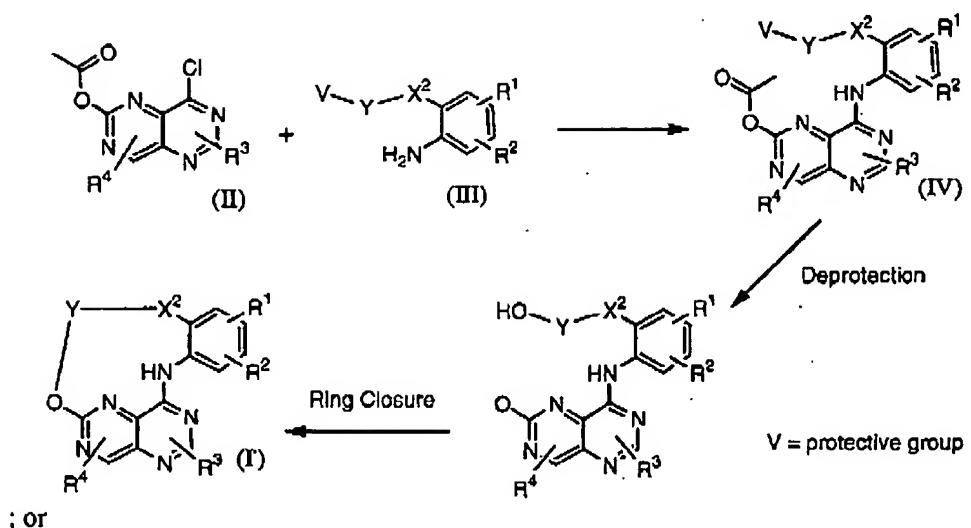
4. (Previously presented) A compound according to claim 1 wherein the R^1 substituent is at position 4', the R^2 substituent is at position 5', the R^3 substituent is at position 3 and the R^4 substituent at position 7 of the structure of formula (I).
5. (Previously presented) A compound according to claim 1, wherein $a^1-a^2=a^3-a^4$ represents $N-CH=CH-CH_2$.

6.-11. (Cancelled)

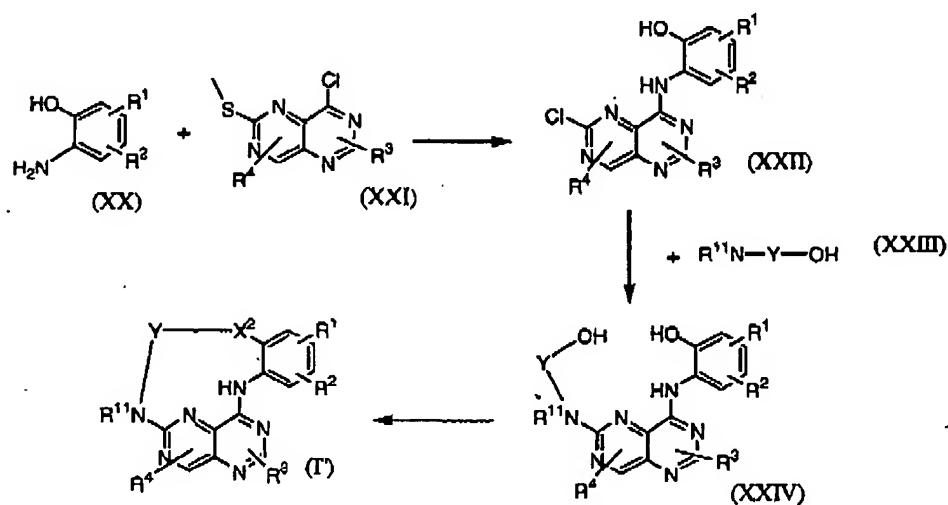
12. (Previously presented) A pharmaceutical composition comprising a pharmaceutically acceptable carrier and, as active ingredient, an effective kinase inhibitory amount of a compound as claimed in claim 1.

13-15. (Cancelled)

16. (Amended) A process for preparing a compound as claimed in claims 1 to 7, comprising;
 - a) coupling 2-acetoxy-8-chloropyrimido[5,4-d]pyrimidine derivatives (II) with suitable substituted anilines (III), to furnish the intermediates of formula (IV), and deprotecting the intermediates of formula (IV) followed by ring closure under suitable conditions.

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b) coupling the known 8-chloro-2(methylthio)-pyrimido[5,4-d]pyrimidine with 2-aminophenol derivatives of formula (XXI), yielding the intermediate compounds of formula (XXII), followed by animating the pyrido[3,2-d]pyrimidine of formula (XXII) using an aminated alcohol (XXIII) under art known conditions, followed by ring closure under Mitsunobu conditions to give the target compounds of formula (I'').



17. (Cancelled)

18. (Cancelled)